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10/800,727	03/16/2004	Atsushi Hirota	118925	1036

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EXAMINER	
FIDLER, SHELBY LEE	
ART UNIT	**PAPER NUMBER**
2861	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/800,727	HIROTA, ATSUSHI	
	Examiner	Art Unit	
	Shelby Fidler	2861	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 May 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8 and 15-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,15-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Responsive Office Action

This Office Action is responsive to amendments and remarks filed 5/29/2007.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Takagi (US 6536880 B2).

Regarding claim 1:

Takagi discloses an ink-jet head, comprising:

a passage unit (cavity plate 10) in which a plurality of pressure chambers (pressure chambers 16) each connected to a corresponding nozzle (col. 3, lines 47-49) are arranged adjacent to each other along a plane (Fig. 3); and

an actuator unit (actuator 20) that is fixed to the passage unit (col. 3, lines 15-18) to change the volume of the pressure chambers (col. 1, lines 17-21),

wherein the actuator unit (20) includes:

a piezoelectric element (e.g. piezoelectric sheet 26) that spans a plurality of pressure chambers (Fig. 5),

a plurality of individual electrodes (drive electrodes 36) that have been sintered (col. 5, lines 9-12, 19-24) on a surface of the piezoelectric element at positions corresponding to the respective pressure chambers (col. 4, lines 13-16 and Fig. 9), and

one or more sintered members (dummy electrodes 36') of substantially the same residual stress characteristics as the individual electrodes (col. 5, lines 7-12 show that the dummy electrodes are made of the same material and are sintered at the same time as the individual electrodes; therefore, they share substantially equal residual stress characteristics) at positions other than positions corresponding to the pressure chambers (Figs. 6 and 9) and that are, on the surface of the piezoelectric element provided with the plurality of electrodes (col. 4, lines 13-22 and Fig. 6), spaced from an outermost one of the individual electrodes with respect to an arrangement direction (longitudinal direction D1, Figs. 2 and 6) of the plurality of individual electrodes in an outward direction from the plurality of individual electrodes (Fig. 6).

Regarding claim 2:

Takagi also discloses that the sintered members (36') and the individual electrodes (36) have substantially the same residual stress characteristics relative to the piezoelectric element (col. 5, lines 7-12 shows that electrodes 36 and 36' were formed at the same time in the same way with the same material; thus their residual stresses would be substantially the same).

Regarding claim 3:

Takagi also discloses that the sintered members (36') and the individual electrodes (36) are made of the same material (col. 5, lines 7-12).

Regarding claim 4:

Takagi also discloses that the sintered members (36') and the individual electrodes (36) have substantially the same shape (both are rectangles, Fig. 6) and the same size (same thickness, Figs. 6 and 7).

Regarding claim 5:

Takagi also discloses that each of the individual electrodes (36), other than the outermost one with respect to the arrangement direction of the plurality of individual electrodes, is surrounded with corresponding ones of the individual electrodes arranged in a predetermined pattern (Fig. 6); and

wherein the outermost one of the individual electrodes with respect to the arrangement direction of the plurality of individual electrodes is surrounded with a corresponding one of the individual electrodes and a corresponding one of the sintered members arranged in substantially the same pattern as the predetermined pattern (Fig. 6).

Regarding claim 6:

Takagi also discloses that the plurality of pressure chambers (16) is arranged adjacent to each other in a matrix on the plane of the passage unit (Fig. 3);

the plurality of individual electrodes (36) are arranged adjacent to each other in a matrix on the surface of the piezoelectric element (26) at positions corresponding to the respective pressure chambers (col. 4, lines 13-16); and

a plurality of sintered members (36') are arranged adjacent to each other (adjacent in the D2 direction) so as to surround the plurality of individual electrodes arranged adjacent to each other in a matrix (Fig. 6).

Regarding claim 7:

Takagi also discloses that the actuator unit (20) also includes a common electrode (common electrode 35) that is formed, on a surface of the piezoelectric element (26) opposite to the surface provided with the individual electrodes (Fig. 7), to span the plurality of pressure chambers (Fig. 5).

Regarding claim 8:

Takagi discloses an ink-jet head, comprising:

a passage unit (cavity plate 10) in which a plurality of pressure chambers (pressure chambers 16) each connected to a corresponding nozzle (col. 3, lines 47-49) are arranged adjacent to each other in a matrix along a plane (Fig. 3); and

an actuator unit (actuator 20) that is fixed to the passage unit (col. 3, lines 15-18) to change the volume of the pressure chambers (col. 1, lines 17-21),

wherein the actuator unit includes:

a plurality of piezoelectric elements (piezoelectric sheets 21-30) that are put in layers and cover the plurality of pressure chambers arranged adjacent to each other in a matrix (col. 4, lines 9-11 and Fig. 5),

a plurality of individual electrodes (drive electrodes 36) that have been sintered (the method of forming a device is not germane to the issue of patentability of the device itself. Therefore, this limitation has not been given patentable weight) on a surface of one of the plurality of piezoelectric elements (piezoelectric sheet 26) and are arranged adjacent to each other in a matrix at positions corresponding to the respective pressure chambers (col. 4, lines 13-16 and Fig. 9),

a plurality of sintered members (dummy electrodes 36') of substantially the same residual stress characteristics as the individual electrodes (col. 5, lines 7-12 show that the

dummy electrodes are made of the same material and are sintered at the same time as the individual electrodes; therefore, they share substantially equal residual stress characteristics) at positions other than positions corresponding to the pressure chamber (Figs. 6 and 9) and that are, on the surface of the one of the plurality of piezoelectric elements (Fig. 6), arranged adjacent to each other (adjacent in the D2 direction) so as to surround the plurality of individual electrodes arranged adjacent to each other in a matrix (Fig. 6), the sintered members and the individual electrodes having substantially the same residual stress characteristics relative to the piezoelectric elements (col. 5, lines 7-12 shows that electrodes 36 and 36' were formed at the same time in the same way with the same material; thus their residual stresses would be substantially the same), and

a common electrode (common electrode 35) that is formed, on a surface of the one of the piezoelectric elements (piezoelectric sheet 27) opposite to the surface provided with the individual electrodes (Fig. 7), to span the plurality of pressure chambers (Fig. 5).

Claims 15-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Takahashi et al. (US 5266964).

Regarding claim 15:

Takahashi et al. disclose an ink-jet head comprising:

a passage unit (channel 34) in which a plurality of pressure chambers (ink channels 32) each connected to a corresponding nozzle (col. 4, lines 51-58) are arranged adjacent each other along a plane (Fig. 1); and

an actuator unit (laminated piezoelectric element 38) that is fixed to the passage unit (Fig. 1) to change the volume of the pressure chambers (col. 4, lines 51-58),

wherein the actuator unit includes:

a piezoelectric element (piezoelectric ceramic layers 40) that spans a plurality of pressure chambers (Fig. 1);

a plurality of individual electrodes (interior positive electrodes 44) that have been sintered on a surface of the piezoelectric element (col. 4, lines 1-4) at positions corresponding to the respective pressure chambers (col. 3, lines 38-41), and

one or more sintered members (interior negative electrodes 42; col. 4, lines 1-4) at positions other than positions corresponding to the pressure chambers (col. 4, lines 36-38) and that are, on the surface of the piezoelectric element provided with the plurality of individual electrodes (Fig. 1), spaced from an outermost one of the individual electrodes (44) with respect to an arrangement direction of the plurality of individual electrodes, in an outward direction from the plurality of individual electrodes (Fig. 3), and

wherein the sintered members and the individual electrodes have substantially the same shape and the same size (Figs. 1 and 3).

Regarding claim 16:

Takahashi et al. also disclose that the sintered members (42) and the individual electrodes (44) have substantially the same residual stress characteristic relative to the piezoelectric element (col. 3, line 62 – col. 4, line 4 show that both electrodes are formed using the same process; col. 3, lines 47-51 show that they are formed of the same material and have the same thickness; and Figs. 1 and 3 show that they have the same shape).

Regarding claim 17:

Takahashi et al. also disclose that the sintered members (42) and the individual electrodes (44) are made of the same material (col. 3, lines 47-51).

Regarding claim 18:

Takahashi et al. also disclose that each of the individual electrodes (44), other than the outermost one with respect to the arrangement direction of the plurality of individual electrodes, is surrounded with corresponding ones of the individual electrodes in a predetermined pattern (Fig. 3); and

wherein the outermost one of the individual electrodes (e.g. right most electrode 44) with respect to the arrangement direction of the plurality of individual electrodes is surrounded with a corresponding one of the individual electrodes and a corresponding one of the sintered members (42) arranged in substantially the same pattern as the predetermined pattern (Fig. 3).

Regarding claim 19:

Takahashi et al. also disclose that the plurality of pressure chambers (32) are arranged adjacent to each other in a matrix on the plane of the passage unit (Fig. 1);

the plurality of individual electrodes (44) are arranged adjacent to each other in a matrix on the surface of the piezoelectric element (Fig. 1) at positions corresponding to the respective pressure chambers (col. 3, lines 38-41); and

a plurality of sintered members (42) are arranged adjacent to each other so as to surround the plurality of individual electrodes arranged adjacent to each other in a matrix (Figs. 1 and 3).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi et al. (US 5266964) in view of Sakaida (US 6174051 B1).

Regarding claim 20:

Takahashi et al. disclose all claimed limitations except that that the actuator unit further includes a common electrode that is formed, on a surface of the piezoelectric element opposite to the surface provided with the individual electrodes, to span the plurality of pressure chambers.

However, Sakaida discloses an actuator unit that includes a common electrode (outer electrode 28) that is formed on a surface of a piezoelectric element (outer piezoelectric ceramic layer 24) opposite to the surface provided with individual electrodes (Fig. 2), to span a plurality of pressure chambers (col. 6, lines 66-67 and Fig. 2).

Therefore, at the time of invention, it would have been obvious to a person of ordinary skill in the art to utilize an outer electrode that formed on a surface of the piezoelectric element opposite the surface provided with individual electrodes, such that the outer electrode spans a plurality of pressure chambers, such as disclosed by Sakaida, into the invention of Takahashi et al. The motivation for doing so, as taught by Sakaida, is to synchronously deform the laminated piezoelectric element in shear mode, and deform the outer piezoelectric element in an expansion mode to enhance electromechanical transducing efficiency (col. 5, lines 4-14).

Regarding claim 21:

Takahashi et al. disclose an ink-jet head comprising:

a passage unit (channel 34) in which a plurality of pressure chambers (ink channels 32) each connected to a corresponding nozzle (col. 4, lines 51-58) are arranged adjacent each other along a plane (Fig. 1); and

an actuator unit (laminated piezoelectric element 38) that is fixed to the passage unit (Fig. 1) to change the volume of the pressure chambers (col. 4, lines 51-58),

wherein the actuator unit includes:

a plurality of piezoelectric elements (piezoelectric ceramic layers 40) that are put in layers and cover the plurality of pressure chambers arranged adjacent to each other in a matrix (Fig. 1);

a plurality of individual electrodes (interior positive electrodes 44) that have been sintered on a surface of one of the piezoelectric elements (col. 4, lines 1-4) and are arranged adjacent to each other in a matrix (Figs. 1 and 3) at positions corresponding to the respective pressure chambers (col. 3, lines 38-41), and

a plurality of sintered members (interior negative electrodes 42; col. 4, lines 1-4) at positions other than positions corresponding to the pressure chambers (col. 4, lines 36-38) and that are, on the surface of the one of the piezoelectric elements, arranged adjacent to each other so as to surround the plurality of individual electrodes (44) arranged adjacent to each other in a matrix (Fig. 3), the sintered members (42) and the individual electrodes having substantially the same residual stress characteristics relative to the piezoelectric elements (col. 3, line 62 - col. 4, line 4 show that both electrodes are formed using the same process; col. 3, lines 47-51 show that they are formed of the same material and have the same thickness; and Figs. 1 and 3 show that they have the same shape), and

wherein the sintered members (42) and the individual electrodes (44) have substantially the same shape and the same size (Figs. 1 and 3).

Takahashi et al. do not expressly disclose that a common electrode that is formed, on a surface of the one of the piezoelectric elements opposite to the surface provided with the individual electrodes, to span the plurality of pressure chambers.

However, Sakaida discloses an actuator unit that includes a common electrode (outer electrode 28) that is formed on a surface of a piezoelectric element (outer piezoelectric ceramic layer 24) opposite to the surface provided with individual electrodes (Fig. 2), to span a plurality of pressure chambers (col. 6, lines 66-67 and Fig. 2).

Therefore, at the time of invention, it would have been obvious to a person of ordinary skill in the art to utilize an outer electrode that formed on a surface of the piezoelectric element opposite the surface provided with individual electrodes, such that the outer electrode spans a plurality of pressure chambers, such as disclosed by Sakaida, into the invention of Takahashi et al. The motivation for doing so, as taught by Sakaida, is to synchronously deform the laminated piezoelectric element in shear mode, and deform the outer piezoelectric element in an expansion mode to enhance electromechanical transducing efficiency (col. 5, lines 4-14).

Response to Arguments

Applicant's arguments filed 5/29/2007 have been fully considered but they are not persuasive. Applicant argues, regarding claim 1, that Takagi does not disclose "one or more sintered members of substantially the same residual stress characteristics as the individual electrodes." Specifically, Applicant argues that it is not enough that the sintered members and the individual electrodes are of the same material and formed at the same time; rather that they

must also be substantially the same shape, substantially the same size, and in substantially the same pattern. Examiner respectfully disagrees. In the context of Figures 6-7 and column 5 of Takagi's disclosure, it is clear that at least some of the residual stress characteristics between these two elements are substantially the same, since both the dummy electrodes 36' and the individual electrodes 36 are both screen printed metals which are sintered onto the same piezoelectric sheet. Examiner notes that dummy electrodes and individual electrodes that are of the same material, formed at the same time, designed to have substantially the same size and shape, and aligned in the same pattern would have equal residual stress characteristics. However, these limitations are not present in the claim. Rather, the only limitation that is present in the currently amended claims is that the sintered members and the individual electrodes have *substantially* the same residual stress characteristics. Therefore, Takagi properly discloses this limitation.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Communication with the USPTO

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shelby Fidler whose telephone number is (571) 272-8455. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Luu can be reached on (571) 272-7663. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Shelby 2. Fidler 7/25/2007

Shelby Fidler
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SUPERVISORY PATENT EXAMINER